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IS 305 (1981): Aluminium Bronze Ingots and Castings [MTD 8: Copper and Copper Alloys]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
SPECIFICATION FOR
ALUMINIUM BRONZE INGOTS AND CASTINGS
(*Second Revision*)

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

SPECIFICATION FOR ALUMINIUM BRONZE INGOTS AND CASTINGS (*Second Revision*)

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Indian Standard

SPECIFICATION FOR ALUMINIUM BRONZE INGOTS AND CASTINGS

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 24 April 1981, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Copper-aluminium alloys (aluminium bronzes) are preferable to copper because of their excellent resistance to corrosion and oxidation, wear by sea water and their superior mechanical properties at room and elevated temperatures. These alloys find extensive use in pump castings, fluid control valves, deck and underwater fittings, propellers, gear blanks, deep drawing dies, non-sparking tools, pickling equipment, worm-wheels, etc.

0.3 This standard was first published in 1952 and revised in 1961. In this revision Grade 3 has been deleted and Grades 1 and 2 redesignated as AB2 and AB1, respectively. Slight modifications have been made in the composition for Grade 1 particularly with regard to alloying elements contents specified earlier. Besides, elongation values for the grades have been revised.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements for two grades of aluminium bronze ingots and castings.

*Rules for rounding off numerical values (revised).

2. SUPPLY OF MATERIAL

2.1 The general requirements relating to supply of material are laid down in IS : 1387-1967*.

3. CHEMICAL COMPOSITION

3.1 The material when analyzed in accordance with IS : 4027-1967† shall have the chemical composition as given in Table 1.

TABLE 1 CHEMICAL COMPOSITION

CONSTITUENT	PERCENT	
	Grade AB 1	Grade AB 2
Aluminium	8.5 to 10.5	8.8 to 10.0
Iron	1.5 to 3.5	4.0 to 5.5
Manganese, <i>Max</i>	1.0	1.5
Nickel	1.0 <i>Max</i>	4.0 to 5.5
Zinc, <i>Max</i>	0.50	0.50
*Tin, <i>Max</i>	0.10	0.1
*Lead, <i>Max</i>	0.05	0.05
*Silicon, <i>Max</i>	0.25	0.10
*Magnesium, <i>Max</i>	0.05	0.05
Total of Sn, Pb, Si and Mg, <i>Max</i>	0.30	0.30
Copper	Remainder	Remainder

*The chemical analysis for these elements is not required if the supplier undertakes and certifies that the material does not contain these elements in excess of the limits stated.

4. MECHANICAL PROPERTIES

4.1 The material, when tested in accordance with IS : 2654-1964‡, shall have the mechanical properties as given in Table 2.

4.1.1 Should a tensile test piece break outside the middle third of its gauge length and the elongation percentage obtained is lower than the minimum specified, the test may at the option of the manufacturer be discarded and another test performed.

*General requirements for the supply of metallurgical materials (*first revision*).

†Methods of chemical analysis of bronzes.

‡Method for tensile testing of copper and copper alloys.

TABLE 2 MECHANICAL PROPERTIES

(Clause 4.1)

MODE OF CASTING TEST PIECES	PROPERTY	REQUIREMENT FOR	
		Grade AB 1	Grade AB 2
Sand cast (separately cast)	Tensile strength, MPa, <i>Min</i>	500	640
	*0.2 percent, proof stress, MPa, <i>Min</i>	170	250
	Elongation percent on gauge length of $5.65\sqrt{S_0}$, <i>Min</i>	18	13
†Chill cast	Tensile Strength, MPa, <i>Min</i>	540	650
	*0.2 percent proof stress, MPa, <i>Min</i>	200	250
	Elongation percent on gauge length of $5.65\sqrt{S_0}$, <i>Min</i>	18	13

NOTE — 1MPa = 0.102 kgf/mm².

*For information only and not a requirement.

†Chill cast test specimen is applicable for ingots when they are required for chill casting purposes.

5. PRESSURE TEST

5.1 If the purchaser requires castings to be tested for pressure tightness, this shall be stated in the enquiry and order. The number of tests, the nature of the test, the test pressure and the testing fluid shall be subject to the agreement between the manufacturer and the purchaser.

6. FREEDOM FROM DEFECTS

6.1 Ingots — The ingots shall be of uniform quality and reasonably free from slag, dross and other harmful contaminations.

6.2 Castings — The castings shall be free from harmful inclusions and cracks. Defects shall be repaired only if agreed to between the purchaser and the supplier. Any casting may be subsequently rejected for faults in manufacture revealed by machining operation notwithstanding that it has passed previously for chemical and mechanical properties.

7. SIZE AND SHAPE

7.1 The ingots shall be of 10 ± 1 kg in weight unless otherwise agreed to between the supplier and the purchaser.

7.2 The dimensions of the castings shall be in accordance with the drawing. All surfaces marked for machining shall have sufficient allowance for that purpose but shall not be too excessive resulting in more machining and in unnecessary increase in the weight of the casting. For surfaces which are not to be machined and unless otherwise specified in the contract, the sectional thickness shall not exceed by more than 5 percent of the specified thickness, or by 2 mm, whichever is more.

8. MARKING

8.1 The name, initials or trade-mark of the manufacturer and the cast number and grade of the material shall be cast or otherwise legibly marked by stamping on each ingot or casting, by which the manufacturer and the grade of the material may be identified. In case of small castings where it is difficult to cast on or stamp all the details, the marking shall be shown in the drawings or as agreed to between the supplier and the purchaser.

8.2 The material may also be marked with the ISI Certification Mark.

NOTE— The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

9. SAMPLING AND CRITERIA FOR CONFORMITY

9.1 Lot— In any consignment, ingots/castings of the same grade (see Table 1) manufactured at the same place shall be grouped together to constitute a lot.

9.2 Sampling for Chemical Analysis— One sample shall be taken and analysed from each cast of 1 000 kg or part thereof of the ingots/castings. However, in case more frequent chemical analysis is required, the same shall be agreed to between the supplier and the purchaser. The sample for chemical analysis shall be taken by drilling or sawing in such a manner as to be representative of the entire cross-section.

Drillings and sawings from ingots/castings shall be obtained in accordance with the appropriate procedure specified in IS : 1817-1961*.

9.3 Sampling for Mechanical Properties — Three test bars shall be separately cast along with the castings for tensile strength for every 1 000 kg or part thereof of the casting. These test bars shall be cast to shape in accordance with 4.3.1 and Appendix B of IS : 1408-1968†. These test bars shall be of suitable size for turning them to the standard dimensions of the test piece as laid down in IS : 2654-1964‡.

9.4 Re-test

9.4.1 If the sample drawn for chemical analysis fails to meet the requirements stipulated in the standard, 2 more tests shall be conducted on the same sample in order to confirm that the analysis has been done properly. If both the test results satisfy the relevant requirements, the lot shall be accepted; and if either of the re-test fails, the lot represented shall be deemed as not complying with the standard.

9.4.2 Should a test piece fail to meet the requirements of the tensile test requirements specified in the standard, two further test pieces which represent the same cast may be tested in the same manner. Should one of the further test pieces meet the requirements of the tensile test, the ingots or castings represented thereby shall be deemed to comply with the standard otherwise the lot shall be rejected.

10. INFORMATION TO BE GIVEN BY THE PURCHASER

10.1 This standard contains a number of clauses in which the purchaser is allowed to exercise an option. The list of information to be given by the purchaser in respect to these clauses is given in Appendix A.

APPENDIX A

(Clause 10.1)

INFORMATION TO BE GIVEN BY THE PURCHASER

A-1. Whether the purchaser wishes to inspect the material at the supplier works (*see 2 and IS : 1387-1967§*).

*Methods for sampling non-ferrous metals for chemical analysis.

†Recommended procedure for inspection of copper-base alloy sand castings (*first revision*).

‡Method for tensile testing of copper and copper alloys.

§General requirements for the supply of metallurgical materials (*first revision*).

IS : 305 - 1981

A-2. The alloy grade required.

A-3. Whether information is required covering the works analysis.

A-4. Detailed drawings of castings.

A-5. In the case of ingots, whether purchaser prefers any special size, shape and mass of the ingots.

A-6. Preparation of test piece for tensile testing.

A-7. Whether a pressure test is required. Details are subject to agreement with the supplier.

A-8. Marking details.

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